

REPORT DOCUMENTATION PAGE

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MEMORANDUM FOR PRS (In-House Publication)

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23 Apr 2003

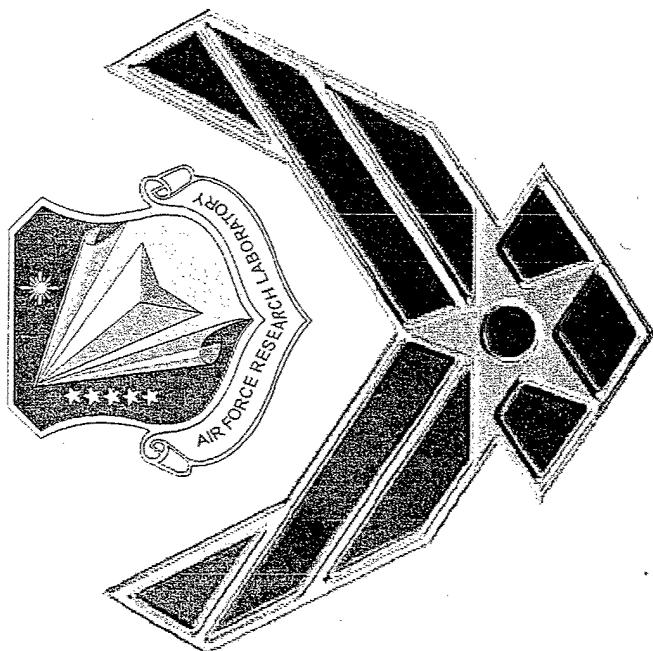
SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2003-100**
5642 C.T. Liu, "Investigating the Crack Growth Behavior in a Particulate Composite Material under Multi-Axial Loading Conditions"

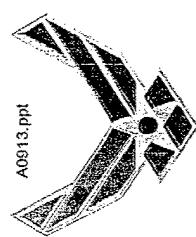
International Conference on Mechanical Behavior of Materials
(Geneva, Switzerland, 25-29 May 2003) (Deadline: 14 May 2003)

(Statement A)

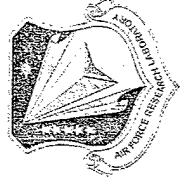
Investigating the Crack Growth Behavior in a Particulate Composite Material under Multi-Axial Loading Conditions.

C. T. Liu
U.S. Air Force Research Laboratory
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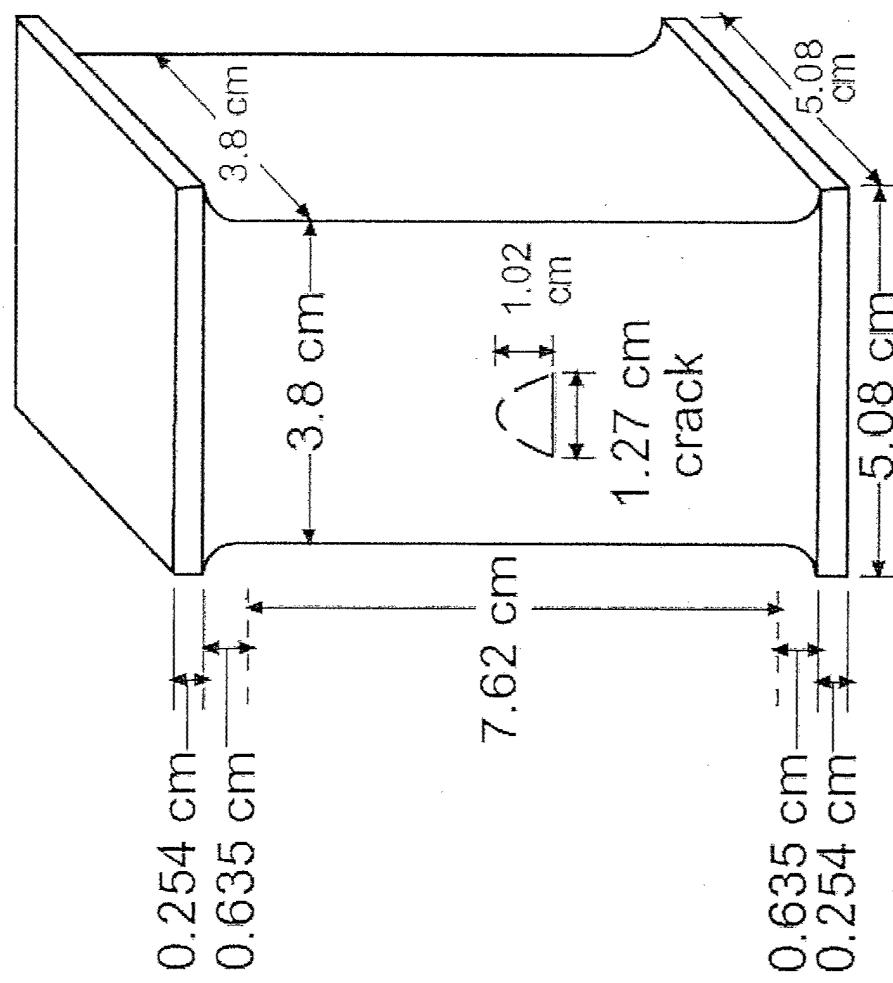
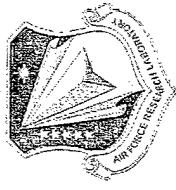
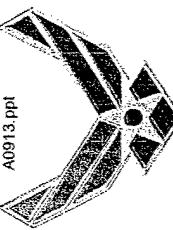


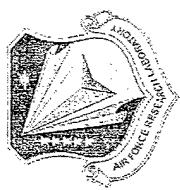
Objectives



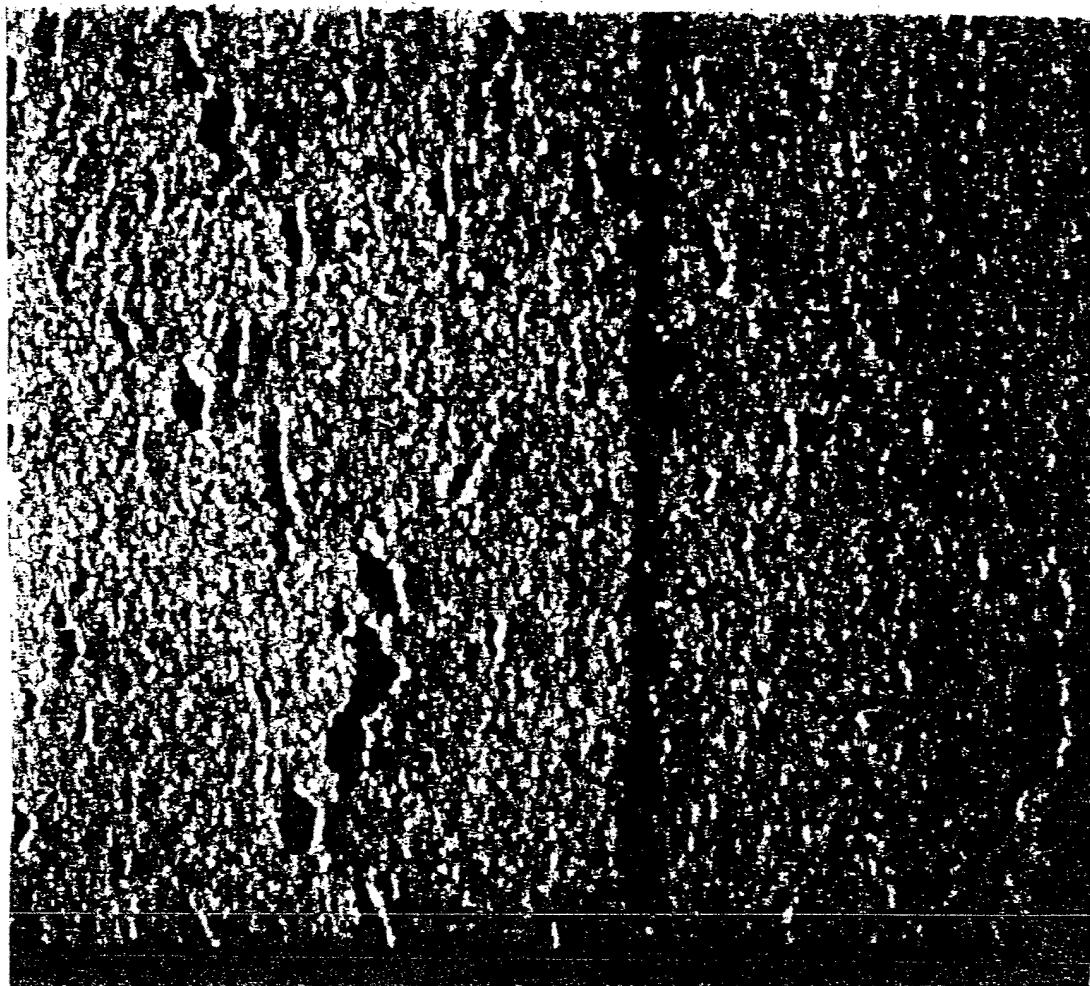
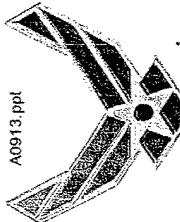
- Investigate the Effect of Loading Conditions on the Crack Growth Behavior in a Particulate Composite Material under Confining Pressure
- Loading Conditions:
 - Constant Strain Rate: 5.8 cm/cm/min
 - Constant Strain: 12%, 15%, and 18%.
 - Confining Pressures: Ambient and 6897 Kpa

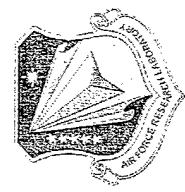
Specimen Geometry



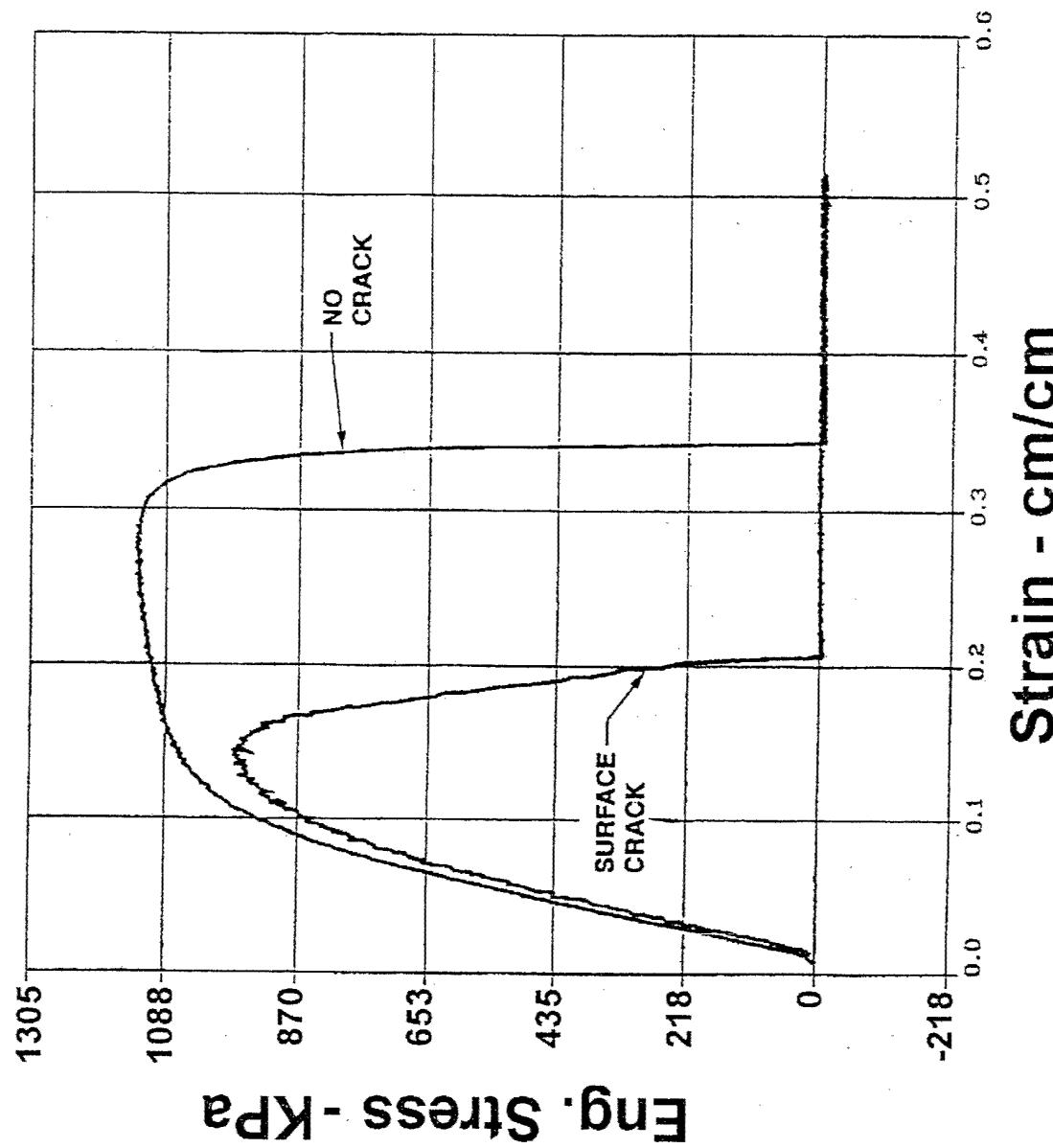
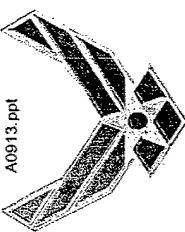


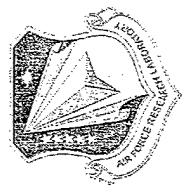
Microcracks in the Specimen under Pressure



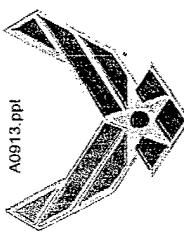
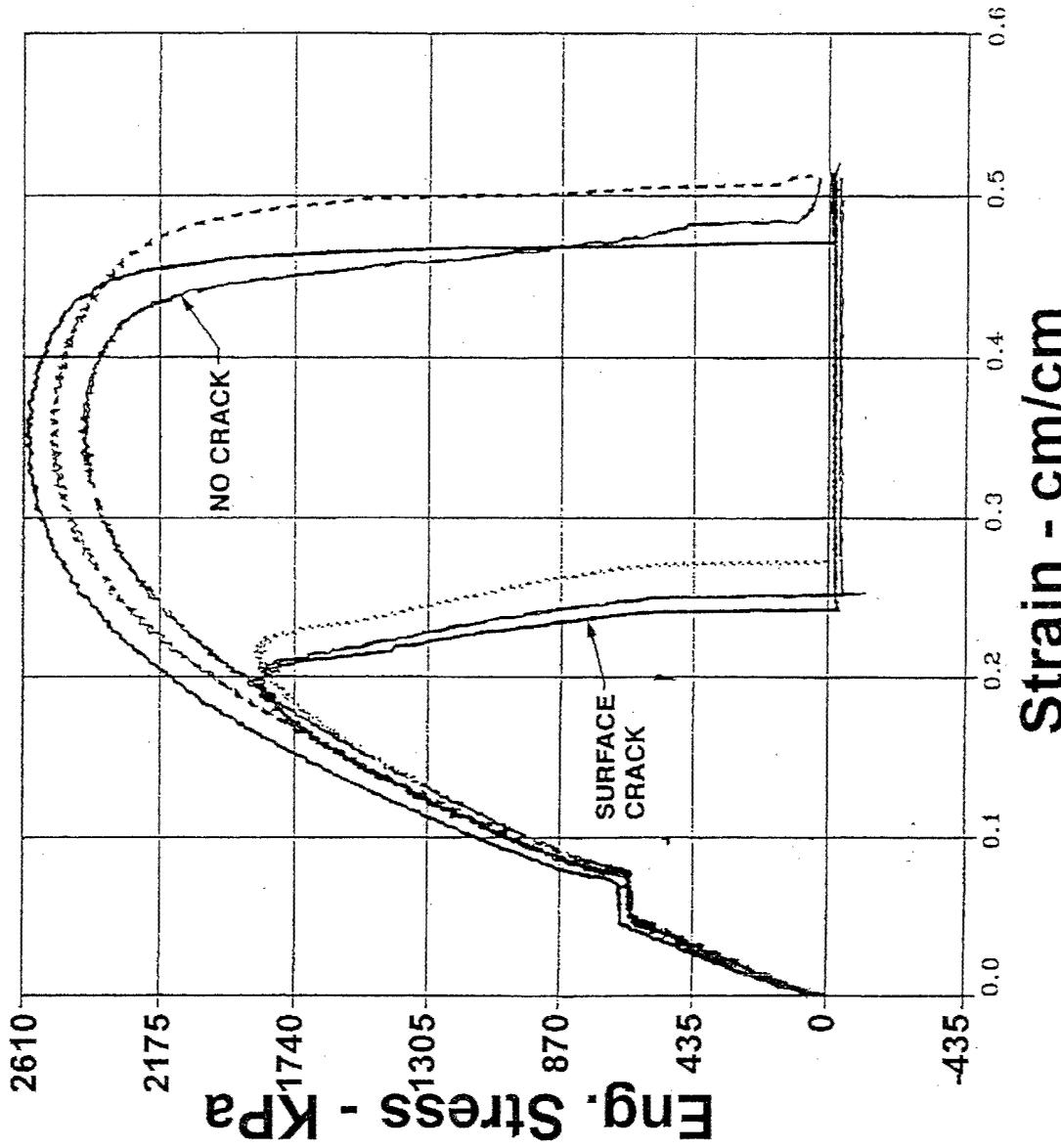


Engineering Stress Vs. Strain (Ambient Pressure)

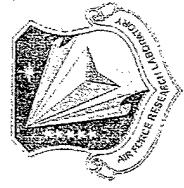




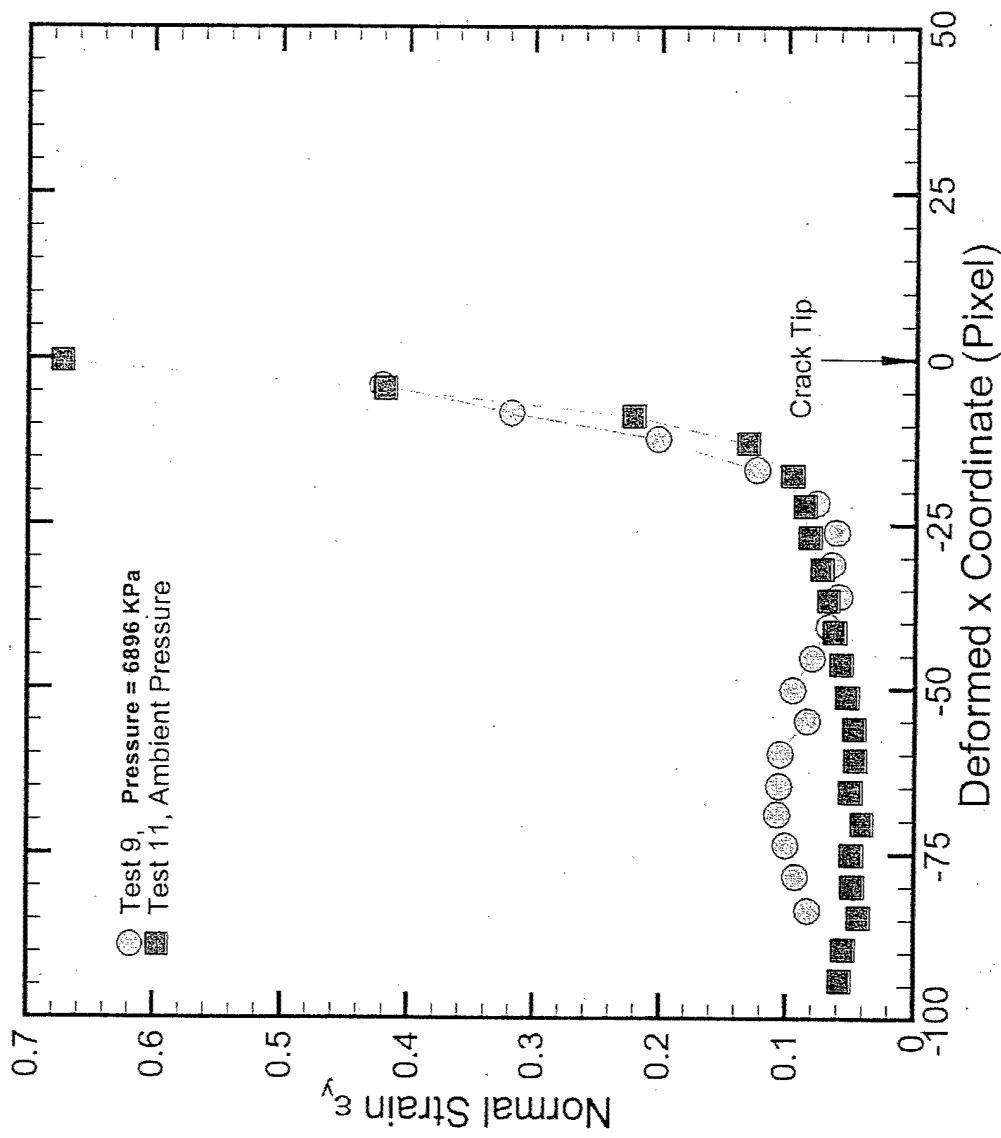
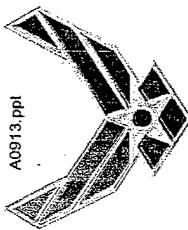
Engineering Stress Vs. Strain (6897 Kpa Pressure)

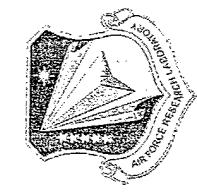


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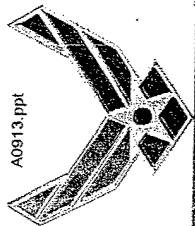


Normal Strain Distribution Ahead of the Crack Tip at the Onset of Crack Growth

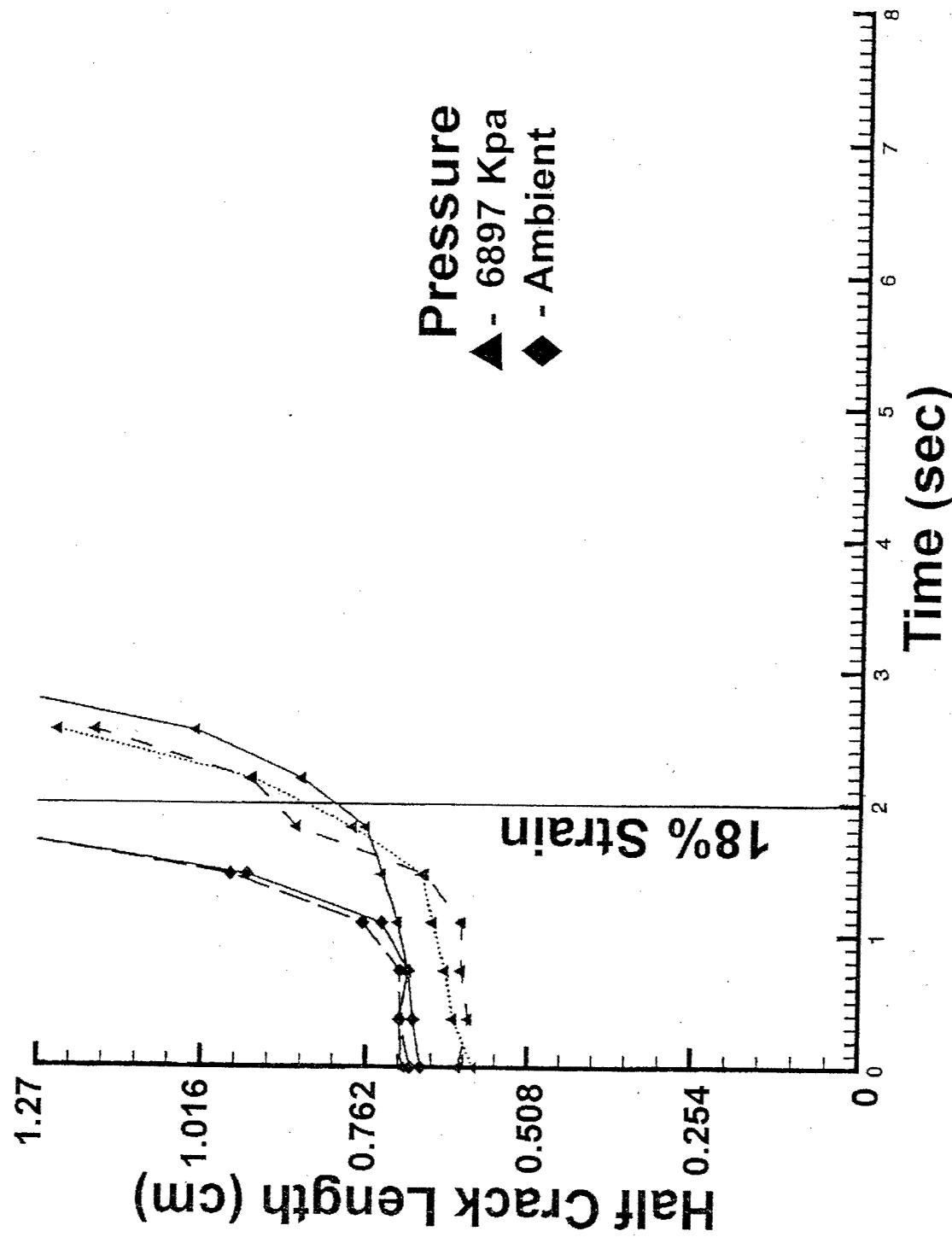




Half Crack Length Vs. Time (Constant Strain Rate Condition)

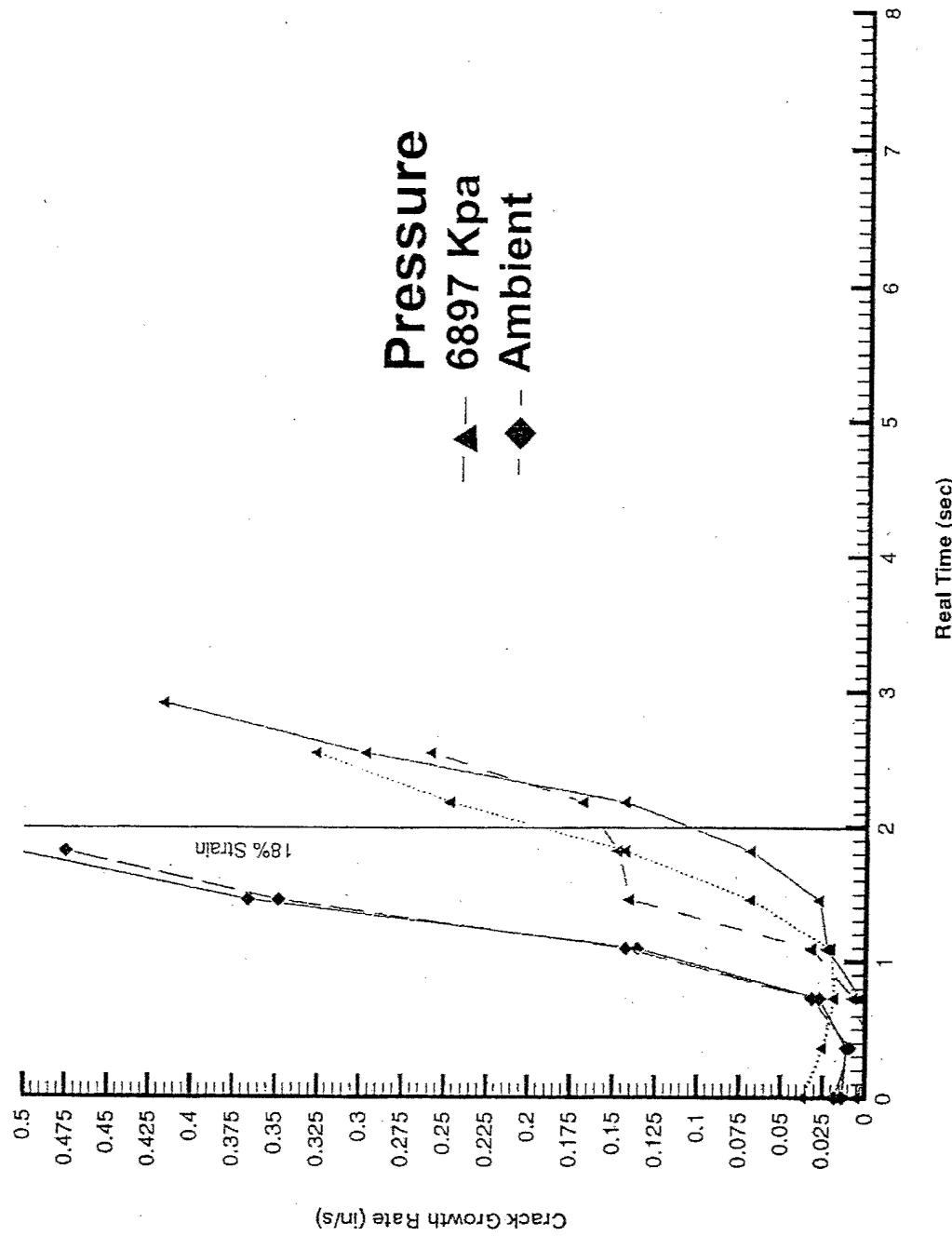
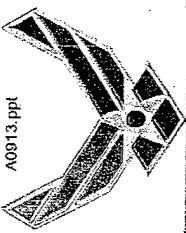


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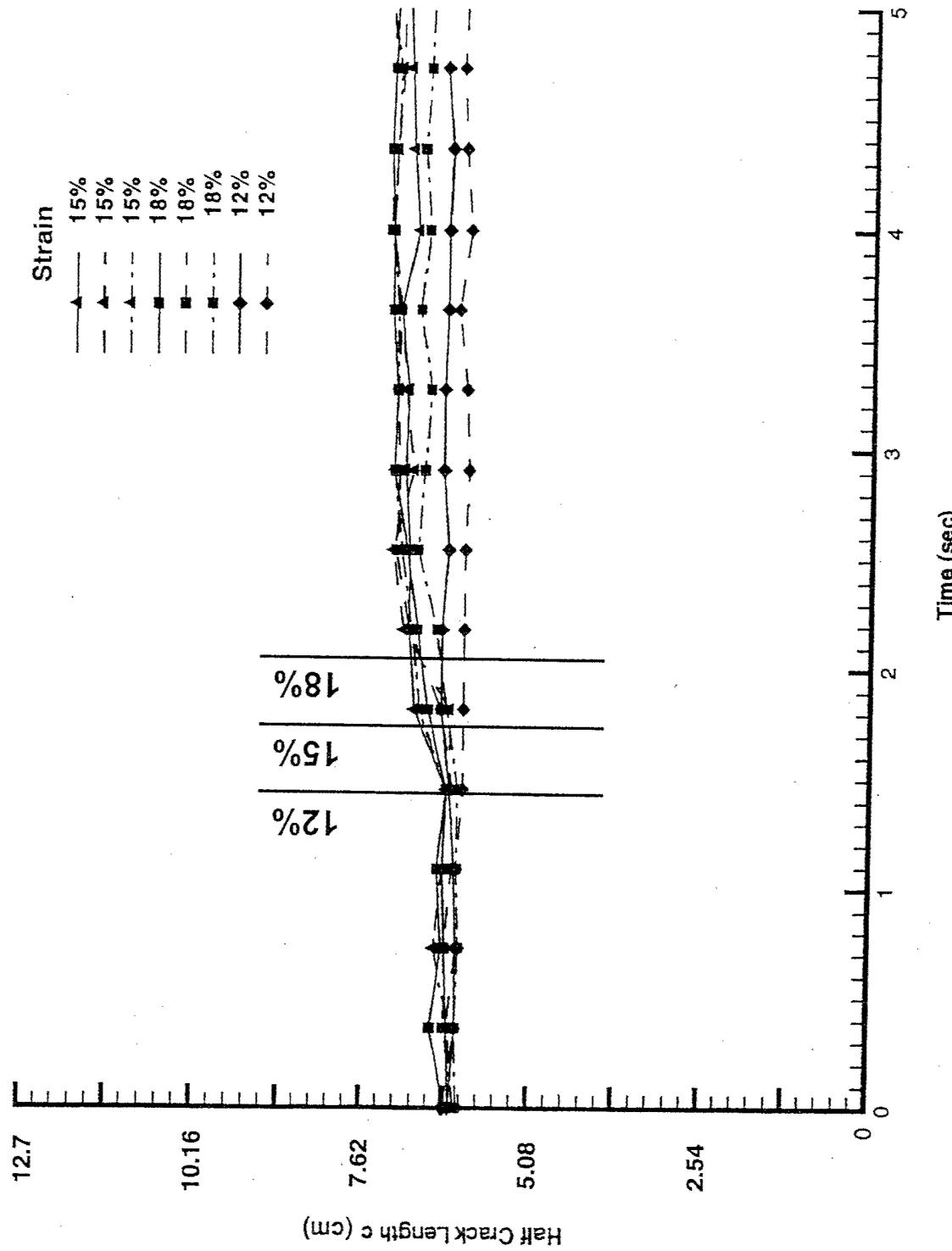




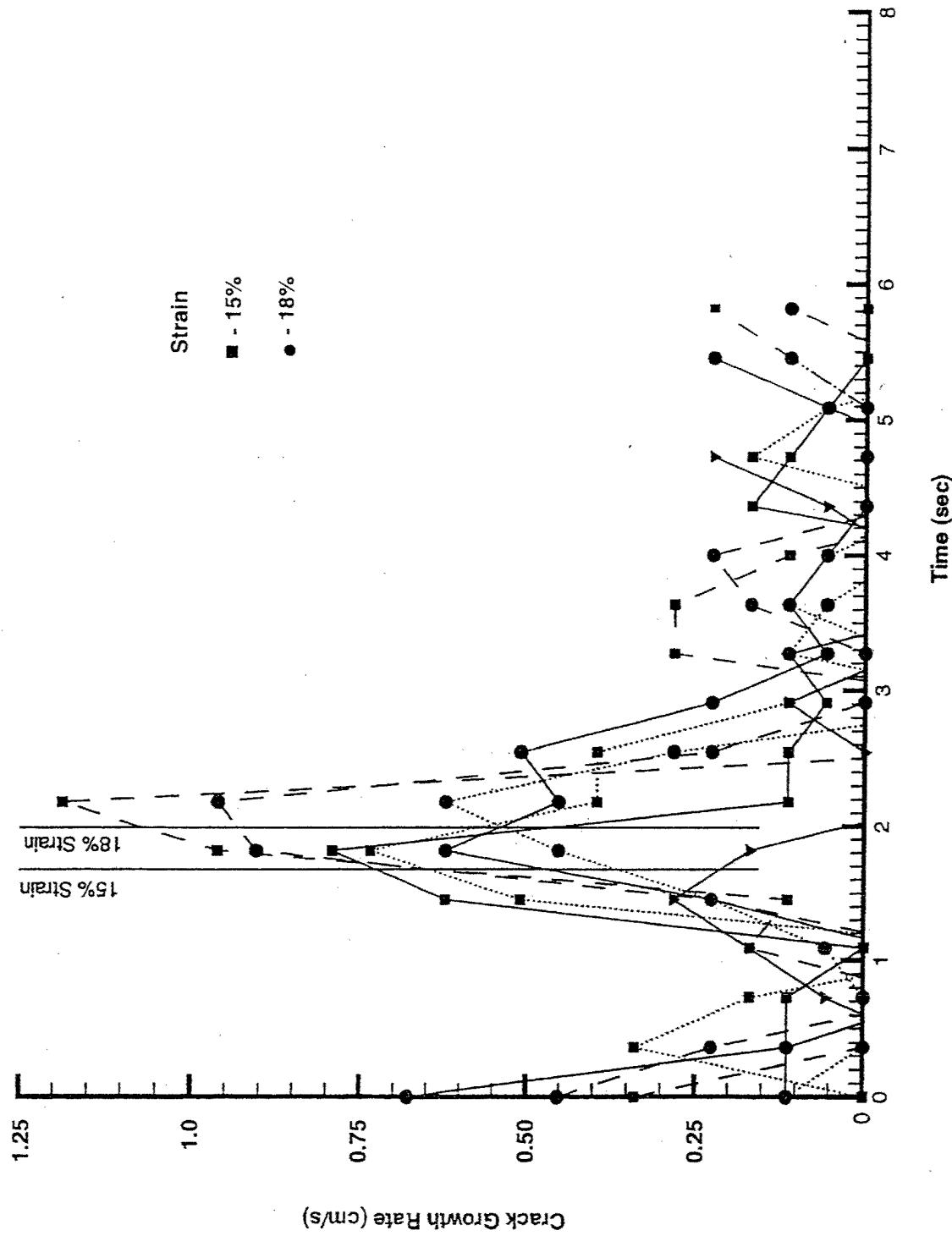
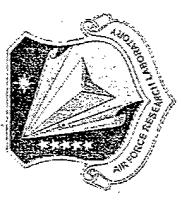
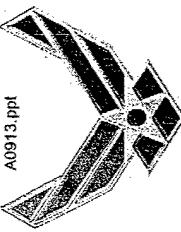
Crack Growth Rate Vs. Time (Constant Strain Rate Condition)

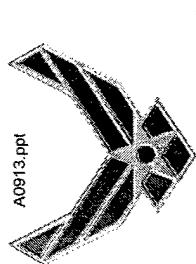


Half Crack Length c Vs. Time



Crack Growth Rate Vs. Time





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Conclusions

- Under constant strain rate condition, the crack growth rate under ambient pressure is significantly higher than that under 6897 Kpa confining pressure.
- Under constant strain condition, in general, the crack growth rate decreases as the applied strain level is decreased.
- Under constant strain condition, the crack stops growth after it propagates a short distance.
- At the onset of crack growth, confining pressure has no significant effect on the size of the high strain region.

